maintaining a means for recording multiple usage bits per block of said

storage means; and

storing in said means for recording multiple usage bits per block

multiple bits for each of a plurality of said blocks of said storage means.--

--21.   The method of claim 20 wherein one bit of said multiple bits for

each of a plurality of said blocks indicates a block's membership in an active

file system and one or more other bits indicate membership in one or more

read-only copies of a file system.--

REMARKS

Claims 1-2 are pending in the present application. Claims 1-2 have

been rejected in the present application. Applicant respectfully requests

reconsideration of pending claims 1-2. Applicant also requests allowance of

new claims 3-21.

Examiner's Objections to the Title

The Examiner has objected to the title of the invention as being non-

descriptive. The Examiner has stated:

> 2.   The title of the invention is not descriptive. A new title is
> required that is clearly indicative of the invention to which the
> claims are directed.

Applicant has amended the title and believes that the new title, "METHOD

FOR MAINTAINING CONSISTENT STATES OF A FILE SYSTEM AND FOR

CREATING USER-ACCESSIBLE READ-ONLY COPIES OF A FILE SYSTEM,"

is indicative of the invention to which the claims are directed.

Examiner's Request for Copy of Prior Art Article described in the Specification

The Examiner has requested that a copy of the prior art article described in the specification on page 1, "The Episode File System," be submitted as relevant prior art. The Examiner has stated:

> 3.   The Examiner requires that the article described in specification on page 1, "The Episode File System" be submitted as relevant prior art.

A copy of this prior art article is submitted herewith.

Examiner's Objections to Informalities in the Specification

The Examiner has objected to the specification for informalities in the Brief Description of the Drawings. The Examiner has stated:

> 4.   The disclosure is objected to because of the following informalities: In the Brief Description of The Drawings, each Figure must be mentioned separately. For example, "Figures 4A-4D" should be amended to recite Figures 4A, 4B, 4C, AND 4D. This error also appears in relation to Figures 9A-9D, 11A-11D, 17A-17L, 18A-18C, and 21A-21F. Appropriate correction is required.

Applicant has made the corrections requested by the Examiner.

Examiner's Rejection of Claims 1 and 2 under 35 U.S.C. §112

The Examiner has rejected pending claims 1 and 2 under 35 U.S.C. §112, second paragraph. The Examiner has stated:

> 5.   Claims 1 and 2 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

> 6.   The claims are incomplete, vague and indefinite. The Examiner is unclear as to what Applicant regards as the invention.

> 7.   Regarding claim 1, it is unclear what is meant by regular files. The specification refers to regular files on page 25, lines 10-12. However, no recitation is made of what would comprise a regular file. The claim is further vague and indefinite in that

the claim recites "flushing regular files to storage means." This is misdescriptive in that the specification recites that the regular files are copied (flushed) to disk, not just to a storage means. This also applies to flushing the special files. In addition, the specification recites only that the dirty blocks are flushed.

8. The claim is incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 706.03(f). While it is uncertain what is meant by "regular files," it is the Examiner's understanding of the disclosed invention that copies of modified blocks, inodes and blockmap are stored on disk. As presently written, the claim merely recites certain files, what exactly these files comprise is unclear, are copied. No recitation is made that these files are copies, of allocating space for these copies or how these files are used to create a consistency point.

9. The claim is incomplete for omitting essential cooperative relationships between the steps of the method, such omission amounting to a gap between the steps of the method. See MPEP § 706.03(f). The claim fails to recite how the steps of the method cooperate to generate a consistency point.

10. The recitation in lines 9-10 are completely unclear. In that the claim fails to recite that any inodes were queued in the first place, it is a non-sequitur to recite requeueing them. In addition, the term "dirty inodes" lacks sufficient antecedent basis.

11. Regarding claim 2, it is unclear what is meant by "pre-flushing." The specification defines flushing as copying. However, the specification fails to define "pre-flushing." In addition, the claim is incomplete for omitting essential steps, such omission amounting to a gap between the steps and is incomplete for omitting essential cooperative relationships between the steps of the method, such omission amounting to a gap between the steps of the method.

Applicant has amended claims 1 and 2, and believes that claims 1 and 2 as amended address the concerns raised by the Examiner and are now in full compliance with the requirements of 35 U.S.C. §112.

Examiner's Rejection of Claims 1 and 2 under 35 U.S.C. §103

The Examiner has rejected claims 1 and 2 under 35 U.S.C. §103. The Examiner has stated:

15. Claims 1 and 2 are rejected under 35 U.S.C. §103 as being unpatentable over Applicants' admitted prior art and Nishigaki et al. (Nishigaki), US Patent 4,043,871.

16.   Applicants admit in the Background of the Invention that it was known to flush (copy) files to a storage means when creating a consistency point.

17.   Applicants characterize the prior art as copying all of the files when creating a consistency point while the claimed invention appears to recite that only modified files and their control structures are copied.

18.   Nishigaki teaches that only modified files need to be copied in order to provide for reliable backup, i.e. creating a consistency point. See the abstract, col. 1, lines 32-60.

19.   It would have been obvious to one of ordinary skill in the art at the time the invention was made to only copy the modified files and corresponding control structures because in the case of a system failure or shutdown the unmodified files and corresponding control structures will not be in an inconsistent state.

Applicant respectfully disagrees. Claims 1 and 2, as amended, claim a method for maintaining a file system stored on non-volatile storage means at successive consistency points. Such a method is not disclosed in the cited prior art. In the method claimed in independent claim 1, blocks of data of the file system that have been modified from a first consistency point, and the meta-data files referencing the modified blocks, are maintained in memory. The file system stored on the non-volatile storage means remains at the first consistency point. A second consistency point is created by copying blocks of data that have been modified since the first consistency point from memory to free blocks of the non-volatile storage means, copying the blocks of meta-file data referencing the modified blocks to free blocks of the non-volatile storage means, and copying a modified file system information structure referencing the modified blocks to the non-volatile storage means. The file system stored on the non-volatile storage means thus progresses directly from a first consistency point to a second consistency point. Claim 2 contains all of the limitations of claim 1 as well as additional limitations.

None of the prior art cited by the Examiner discloses a file system that is maintained in non-volatile storage means at successive consistency points as claimed in amended claims 1 and 2 of the present invention.

The prior art systems disclosed by Applicant in the Background of the Invention do not maintain file systems in non-volatile storage means (such as hard disk drives) at successive consistency points. Instead, the prior art systems disclosed by Applicant, as described on pages 3 and 4 of the application, perform intermediate writes to the file system between consistency points, relying on logging, ordered writes, and recovery processes to recover the file system to a consistent state upon system failure. In the present invention as claimed in claim 1, on the other hand, the file system stored in non-volatile storage means is maintained at successive consistency points. Accordingly, recovery processes as in the prior art are not required upon system failure to return the file system to a consistency point.

Nishigaki also does not disclose a method for maintaining a file system at successive consistency points in non-volatile storage means as claimed. Nishigaki discloses two recovery processes for databases. The first method Nishigaki calls the "shadow page" method. Under the shadow page method, each update that is part of a data base transaction is written directly to the non-volatile storage means at locations referred to as "shadow pages." At the same time, a page table is updated to identify the page containing the updated record. When the transaction is completed, the updated page table becomes the valid page table. The second method disclosed by Nishigaki consists of making a back-up copy of the complete data base and maintaining a transaction log of update data. Upon system failure, the back-up copy and the transaction log are used to recover the data base. Nishigaki does not disclose maintaining a file system at successive consistency points by maintaining modified blocks in memory, writing modified regular file data to free blocks of the non-volatile storage means, writing modified meta-data file data to free blocks of the non-volatile storage means, and writing a modified file system information structure to the non-volatile storage means, all as claimed in claim 1.

Accordingly, applicant believes that claim 1 as amended, is patentably distinct over Nishigaki and the prior art systems described by applicant in the Background of the Invention. Claim 2 is dependent on claim 1 and contains all of the limitations of claim 1 as well as additional limitations. Accordingly, applicant believes that claim 2 as amended is patentably distinct over the prior art as well.

New Claims 3 to 21

Applicant has added new independent claims 3, 7, and 20 and new dependent claims 4-6, 8-19, and 21.

New Independent Claim 3

New claim 3 is an independent claim claiming a method for maintaining a file system at successive consistency points. Applicant believes that none of the cited prior art discloses the method claimed in claim 3. Accordingly, applicant believes that claim 3 is patentably distinct from the prior art of record.

New Dependent Claims 4-6

New dependent claims 4-6 are dependent on claim 3 and contain all of the limitations of claim 3 as well as additional limitations. Accordingly, applicant believes that claims 4-6 are patentably distinct from the prior art of record.

New Independent Claim 7

New claim 7 is an independent claim claiming a method for creating a plurality of read-only copies of a file system. Applicant believes that none of the cited prior art discloses the method claimed in claim 7. Accordingly, applicant believes that claim 7 is patentably distinct from the prior art of record.

New Dependent Claims 8-19

New dependent claims 8-19 are dependent on claim 7 and contain all of the limitations of claim 7 as well as additional limitations. Accordingly, applicant believes that claims 8-19 are patentably distinct from the prior art of record.

New Independent Claim 20

New claim 20 is an independent claim claiming a method for recording a plurality of data about blocks of data stored in a storage means using a means for recording multiple usage bits per block of the storage means. Applicant believes that none of the cited prior art discloses the method claimed in claim 20. Accordingly, applicant believes that claim 20 is patentably distinct from the prior art of record.
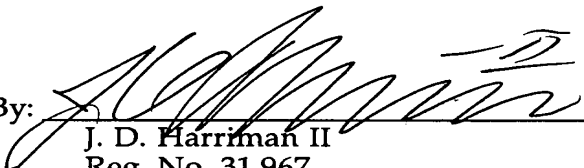
New Dependent Claim 21

New dependent claim 21 is dependent on claim 20 and contains all of the limitations of claim 20 as well as additional limitations. Accordingly, applicant believes that claim 21 is patentably distinct from the prior art of record.

CONCLUSION

Applicant believes that amended claims 1 and 2, and new claims 3-21, comply with the provisions of 35 U.S.C. §112 and are patentably distinct from the prior art of record. Accordingly, applicant respectfully requests that claims 1-21, as amended, be allowed.

Respectfully submitted,

Hecker & Harriman

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